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ABSTRACT

The purpose of the Elementary Technology Demonstration Schools (ETDS) Project, funded by IBM and Apple, Inc., was to demonstrate the effectiveness of technology in accelerating the learning of low achieving at-risk students and enhancing the education of high achieving students. The paper begins by giving background information on the district, the schools involved in the project, and the ETDS project. It is noted that the four participating elementary schools received microcomputers for teachers, students, and laboratories from IBM (three schools) and Apple, Inc. (1 school); the laboratories at all four schools were networked through a file server into an integrated learning system; and all schools had both instructional and tools software. The paper then presents the lessons learned during the first year of implementation of the project as identified in interviews with the school principals. The lessons are presented as issues schools need to consider when implementing a computer technology program: (1) training of teachers should occur when equipment is installed and operable; (2) time goals for computer use should be set by each school for individual grade levels and subjects to conform to specific needs and goals; (3) establishing a computer continuum that delineates specific computer skills students should acquire in each grade facilitates meeting specific school needs; (4) computers can be used to help meet specific school objectives more effectively; and (5) the shift in instructional methods demands considerable time and effort from teachers and staff. Four tables provide additional details of the project, and two attachments contain data on the ETDS schools membership and ethnicity and a copy of the Galindo Elementary School Computer Continuum. (Contains 43 references.) (ALF)

Large-Scale Campus Computer Technology Implementation: Lessons from the First Year

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The Elementary Technology Demonstration Schools (ETDS) Project in the Austin Independent School District (AISD) is part of a larger effort known as Project A+. Project A+ is an AISD/International Business Machines Corporation (IBM) initiative established in the spring of 1989, designed to improve the District's educational environment by marshalling community resources. The primary purpose of ETDS is to demonstrate the effectiveness of technology in accelerating the learning of low achieving at-risk students and enhancing the education of high achieving students. The project goals are outlined in Figure 1 below.

Project Goals

Overall Project A+ Goal: Have all students functioning successfully at or beyond age-appropriate grade level.

ETDS goals:

- ✓ In three years, reduce by 50% the number of students who are not in their age-appropriate grade level.
- ✓ In three years, reduce by 50% the number of students who are not achieving on grade level in reading, writing, and mathematics.
- ✓ Develop a comprehensive teacher training program to ensure effective implementation and classroom use of technology.
- ✓ Demonstrate to the community the educational benefits of technology, thereby obtaining support for districtwide implementation.

Figure 1 Project Goals

ETDS, made possible by a $4.4 million grant from IBM and a $74,700 grant from Apple, Inc., equipped four elementary schools with computer hardware and educational software. The 1990-91 school year was the first year of ETDS implementation. In the summer of 1991, those four schools offered summer school classes for at-risk students. An evaluation report published during the summer of 1991 detailed the main issues from the first year of project implementation. Evaluation of project outcome in terms of student achievement was very preliminary at that time because of holdups in equipment delivery which caused the completion of hardware installation to be delayed until the middle of the year. Nevertheless, the schools involved gained valuable experience during this first year of project implementation. This paper seeks to share the experiences of the schools from the first year of implementation of a large-scale campus computer technology program.

The purpose of this paper is to present the lessons learned from the first year of implementation of the ETDS project. These lessons are presented in the form of a recommended agenda of issues schools and school districts should incorporate into the planning process when implementing a campus computer technology program. By sharing information and experiences, other schools and school districts contemplating programs similar to ETDS can benefit from the experiences of the AISD schools. The first part of the paper gives background on the District, the schools involved in the project, and on ETDS. The second part presents the lessons learned during the first year.

District and Program Background Information

The Austin Independent School District is located in central Texas, in the State capital. The District falls in the Texas Education Agency category of above average wealth, but 43 percent of the students qualify for free or reduced-price lunch. Enrollment and ethnicity statistics for the District are presented in Figure 2. Statistics for the four elementary schools involved in ETDS may be found in Attachment A.

AISD Membership and Ethnicity Statistics, October 4, 1991

	Count	Fercent
Membership		
Elementary	38,346	56.7
Middle/Jr. High	13,450	20.0
High School	15,861	23.4
Ethnic Distribution		
White	30,608	45.2
Hispanic	24,068	35.6
Black	12,981	19.2
Total	67,657	100.0

Figure 2 AISD Statistics

ETDS equipped the four schools with computer hardware and educational software. Three schools received IBM equipment and one school received equipment from Apple. The number of computers provided by ETDS placed the schools far above the national average in terms of computers per school. A 1989 nationwide random sample by the Center for Technology in Education found, on the average, 26 computers per school. ETDS equipped the four schools with 139 to 318 computers. Information about the types and distribution of the computers is detailed in Figure 3.

Each of the schools received three types of computers: teacher computers, student computers, and computers for laboratories. Every teacher at the four schools was given a computer, and all four schools have multiple laboratories. In the IBM-equipped schools each classroom contains student computers: Grades 1-5 classrooms have four computers, while pre-kindergarten, kindergarten and special education classrooms have two computers each. The school equipped with Apple machines did not receive sufficient computers to place student computers in every classroom.

Computers at Schools

Computer Type	Andrews	Langford	Patton	Galindo
IBM Student Machines (PS/2 Model 25)				
Grades 1-5 (4 per class)	30	18	22	0
Pre-K, K, Special Ed. (2 per class)	124	72	152	0
Apple Student Machines (IIGS and IIE)	0	0	0	45
IBM Laboratory Machines (PS/2 Model 25)				
Writing to Read	18	9	18	0
Student Laboratories	24	24	24	0
Apple Laboratory Machines (Mac Plus and IIGS)	0	0	0	54
IBM Take-Home Machines (PS/2 Model 25)	40	40	40	0
Apple Take-Home Machines	0	0	0	0
IBM Teacher Machines (PS/2 Model 30)	58	41	62	0
Apple Teacher Machines (Macintosh SE)	0	0	0	40
TOTAL	294	204	318	139

Figure 3 Schools Equipped with Computers by ETDS

ETDS also supplied the schools with networking devices. The laboratories at all schools are networked through a file server into an integrated learning system. Student and teacher computers at the IBM-equipped schools are networked as well through an IBM PS/2 Model 80 file server. The teacher computers are connected by a token-ring adapter to the servers and the student computers are connected with baseband cabling. The system runs with Novell software. The networks reduce the time required for loading programs, allow for evaluation by computer logs, broaden

communication and information sharing possibilities, and allow for centralized software manipulation.

Instructional Software at ETDS Schools

IBM Schools	Apple School
Reading/Language Arts	**Reading/Language Arts**
Bouncy Bee Learns Letters	The Muppet Word Book
Bouncy Bee Learns Words	Muppets on Stage
Writing To Read"	Color Me
Primary Editor Plus	Muppetville
Voy a Leer Escribiendo (Vale)	Touch 'N Write
Mi Editor Primerio	Talking Text Writer
Touch Typing for Beginners	Sound Ideas
Reading for Meaning Series	Where Did My Toothbrush Go?
Reading for Information Series	Monsters & Make Believe
Spelling Series	Words at Work Series
Vocabulary Series	Those Amazing Reading Machines
Parts of Speech Series	Phonics Prime Time
Punctuation Series	First-Letter Fun
Combining Sentences Series	Fun From A to Z
Alphabet Circus	Picture Chompers
Comparison Kitchen	Word Herd
Stories and More	
Mathematics	**Mathematics**
Math Concepts Series	Addition Logician
Exploring Measurement, Time and Money	Circus Math
Math Practice Series	Conquering Decimals
Number Farm	Fraction Practice Unlimited
Comparison Kitchen	Multiplication Puzzles
	Quotient Quest
	Space Subtraction
	Subtraction Puzzles
Tools	**Tools**
The Writing and Publishing Center	WordPerfect
DisplayWrite Assistant	Bank Street Writer
LANSchool	Talking Text Writer
LinkWay	Color-Me
Microsoft Works	

Figure 4 Instructional Software at Schools

All schools have both instructional and tools software. The software on the network servers is consistent at the IBM-equipped schools. See Figure 4 for a listing of the software available at the schools.

The Zero Dropout Momentum Team and the Technology Momentum Team, two of seven such teams comprised of IBM staff members, AISD staff members, and members of the community as part of Project A+, conceived the ETDS project in 1989. By keeping students on pace for graduation, ETDS is designed to contribute to a reduction in the District dropout rate. Over 40 schools submitted applications for the project, and the program was scheduled to begin at the four selected schools at the beginning of the 1990-91 school year. Teachers from the four schools began receiving training in computer operation during the summer of 1990.

Lessons from the First Year

As of the January 1992 writing of this report, ETDS has been in operation for a year and a half. As mentioned above, evaluation of the impact of the project in terms of student outcomes was very preliminary after the first year because of equipment delivery delays. A full project evaluation is planned following the 1991-92 school year. Nonetheless, the schools have gained valuable experience in the implementation of a large-scale campus computer technology program--experience that is worth sharing. As more schools and school districts begin installing computers at campuses, the sharing of information and experiences can help reduce the learning curve for all involved. This part of the paper presents the lessons from the first year of project implementation. The lessons are presented as issues schools should consider when planning for campus technology implementation.

Information for this section was gathered by conducting interviews with each school principal to supplement the constant project monitoring. The suggestions that follow represent the aggregated experience of all involved; hindsight and experience have been valuable teachers. The suggestions that follow are presented in the form of an agenda of items schools should consider when planning for a campus-based computer technology program. The suggestions are important issues the schools feel are vital to take under consideration.

The common thread permeating all the suggestions is the belief that computer technology can be effectively used to improve classroom instruction. The schools believe technology can accelerate the learning of low achieving students and enhance the education of high achieving students, as the goals of ETDS propose. The computers alone are insufficient to accomplish this, however. Many other changes are necessary, including a fundamental change in instruction and learning methods. The road is not always smooth, but as one principal stated in the course of interviews for this paper, the successes of the program outweigh the problems one-hundred fold.

Timing (of Training) is Everything

Repeated studies have linked student academic achievement to the amount of training received by teachers. A study by Alice W. Rice (reviewed in a research abstract by Norman Bell) takes this link one step further and suggests that inadequate teacher training (defined as fewer than 10 hours) is a negative predictor of student achievement. In other words, student academic achievement is better if the teachers receive no training than if they receive less than 10 hours of training. The issue in ETDS was not the amount of training, but the timing of the training. Training for teachers in the IBM schools began in July 1990, before all of the hardware arrived. Sessions on different topics were subsequently offered in September, October, November, and December. Training for the Apple School began in September and continued through November. Training was scheduled at this early date because 1) The training required many hours and 2) The hardware was scheduled to be completely installed by October. The teachers received their computers prior to the beginning of school and could begin using the tools (such as gradebooks and electronic mail) right away. However, the student computers were not fully implemented until January at the earliest, and April at the latest. The lag between training and complete hardware installation diminished the value of the training. Many teachers experienced frustration with what they perceived as wasted training. Now, when training is planned for new software, it is often delayed until the actual arrival of the software. It should be noted that there may be a tradeoff between time availability and waiting on the software arrival. **Training in software and hardware should be carefully timed. If possible, training should be delayed until the equipment is installed and operable at the campus.**

Time on Task Targets

The precise curriculum mix of computer instruction and textbook instruction will depend on the needs of each school, grade level, and/or classroom. Each unit decides whether the textbook will lead and the software will supplement or vice-versa. Whichever method is chosen, it is important to set computer-use time targets for students. The form in which this is done varies. At the Apple school, a goal of three hours weekly of lab use for all grades was targeted initially. Summer school, which featured intensive daily computer use for at-risk younger students, convinced the teachers of the value of daily usage in the lower grades. The school subsequently changed the goals to one hour daily for grades 2-3 and two hours weekly for grades 4-5. One IBM school does not set specific numeric time goals, but does target daily language and mathematics computer use. Another school targets one hour daily, divided into 20 minutes each for reading, writing, and mathematics. **It is important to establish time goals for computer use. These goals should be set by each campus for individual grade levels and subjects and should conform to that campus's needs and instructional goals. The goals should be flexible and change over time to reflect school experience and knowledge.**

Computer Continuum

In addition to establishing time-use objectives, some of the schools have developed a computer continuum, which delineates specific computer skills students should acquire in each grade. The schools feel the continuum is useful, because it brings into sharper focus what the staff wants students to learn and how computers will be incorporated into instruction. The continuum can also be used to coordinate instructional activities between grade levels. The complexity of the continuum varies (See Attachment B). Schools may choose to establish general guidelines for each grade or may set more specific goals. The method by which the continuum is developed varies as well. At the

Apple school, a technology committee, comprised of 13 teachers, developed a continuum and proposed it to the overall staff. The staff of another school met in grade-specific groups to develop priorities by subject, then met as a staff to discuss the outcomes. This school has a history of developing a campus-specific continuum, and the computer concepts were simply incorporated into the larger continuum. In either case, the continuum is organic and undergoing constant modification. **Establishing a campus-specific computer continuum is useful because it facilitates meeting specific campus needs and brings into sharper focus how the computer will be incorporated into instruction and learning.**

Meeting Specific Campus Objectives

While the core software at the IBM schools is the same, the manner in which the software is used differs. Details on how this use actually differs will be available in the 1991-92 school year evaluation report, which will contain analyses of the computer logs. In the first year, the schools have learned how to utilize the software and hardware to better meet campus-specific objectives. One common need relates to teaching students of different skill levels within the same classroom. The schools are learning to use the feature of the integrated learning system which allows for different levels of difficulty to be targeted at different students through the networking device. This is then applied to help meet testing and other instructional objectives. The computers can also aid in meeting campus-specific objectives in skill acquisition. One campus moved State-mandated mastery of keyboarding skills from fourth grade to third grade. Schools also use the computers as tools to help students improve writing and thinking skills by expressing (in writing) recent experiences. For example, one school makes a biannual visit to a State school for disadvantaged children. Now upon returning to the home school, students are

required to write about their experiences. **Computers can be used to help meet campus-specific objectives more effectively.**

Changes in Instructional and Learning Methods

The computer alone does not bring about improvements in student learning and achievement--to accomplish these goals, the computer must be effectively employed in instructional delivery. Learning to master computer-based practices and approaches takes time; the Center for Technology in Education Survey found teachers' practices take five to six years to become well organized. In order to effectively utilize the computers, the ETDS schools have been switching towards a centers-based learning approach and relying less on direct-teach methods. At the IBM schools, the Teaching and Learning with Computers (TLC) delivery system is being employed. This paradigm shift requires a dedicated staff, strong leadership from the principal, and considerable time and effort. The staff must be willing to try new approaches to teaching. All teachers at the ETDS schools were given the option to transfer elsewhere in the district if they did not want to participate in the project. The computers also aid the instruction of heterogeneous groups of widely differing skill levels. The bookmark feature, which allows individual students to be advanced to specific levels in the software, combined with the immediate feedback the computers provide, are useful tools in reaching a diverse group. **The paradigm shift in instruction methods required to optimally utilize the computer technology demands considerable time and effort from teachers and staff. Used appropriately, the computer offers many tools, such as immediate feedback and bookmarking, that aid in teaching a heterogenous group of students of widely differing skill levels.**

Conclusion

The first year of ETDS project implementation has taught valuable lessons to the four elementary schools involved in the project. The schools are now turning the corner from project implementation to using technology to improve student instruction and achievement. Evaluation of the project in terms of impact on student achievement will become available in the summer of 1992. The recommendations presented in this report represent the collective experience of the staff involved in the project. It should be emphasized that these recommendations are applicable to campus computer technology programs of all sizes. Schools need not implement a program on the same scale as the ETDS schools to incorporate these suggestions into their project planning:

- ✓ Timing of training,
- ✓ Time on task targets,
- ✓ Computer continuum,
- ✓ Meeting specific campus objectives, and
- ✓ Changes in instructional and learning methods.

ATTACHMENT A--ETDS Schools Membership and Ethnicity Statistics October 4, 1991

	Black		Hispanic		White		Total
	N	%	N	%	N	%	
Andrews	443	51	351	40	81	9	875
Galindo	60	8	455	60	240	32	755
Langford	108	19	266	46	199	35	573
Patton	39	4	104	10	879	86	1,022
TOTALS	650	20.1	1,176	36.5	1,399	43.4	3,225

ATTACHMENT B--School Computer Continuum

Galindo Elementary School Computer Continuum--January 1992

Second Grade:

- Know the home row hand position
- Know correct fingering of other keys
- Know how to set Font, Size, and Style
- Be introduced to the ruler
- Save to a disk
- Print out a document
- Standardized heading (name at top left)

Third Grade:

- Review fingering and hand position of keyboarding skills
- Review how to change Font, Size and Style
- Standardize heading (name at top left)
- Know how to center titles
- Begin using the Thesaurus
- Begin using the Spell Checker
- Cut and paste within a document
- Center titles

Fourth Grade:

- Review previous skills taught
- Standardize heading (name at top right corner)
- Work with graphics some
- Continue working with the Thesaurus
- Continue working with the Spell Checker
- Center titles

Fifth Grade:

- Review Basics
- Use more graphics
- Set tabs
- Introduce more publishing features

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